

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:	§	
Olivier Lavastre et al.	§	
Serial No.: 10/591,408	§	Group Art Unit: 1796
	§	
Confirmation No.: 3407	§	
	§	
Filed: July 19, 2007	§	Examiner: C. Caixia Lu
	§	
For: Ionic Liquids for Heterogenizing	§	Atty. Docket No.: F-916
Metallocene Catalysts	§	

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Honorable Commissioner:

**APPEAL BRIEF**

Appellants submit this Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 1796 dated July 10, 2008, finally rejecting claims 13-32.

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### **Real Party in Interest**

The present application has been assigned to Total Petrochemicals Research  
Feluy, Zone Industrielle C, B-7181, Feluy, Belgium.

### **Related Appeals and Interferences**

Appellants assert that no other appeals, interferences or judicial proceedings are known to the Appellants, the Appellants' legal representative or Assignee that will directly affect, be directly affected by or have a bearing on the Board's decision in the pending appeal.

### **Status of Claims**

Claims 13-32 are pending in the application. Claims 1-12 were canceled by Preliminary Amendment. Claims 13-32 stand rejected under 35 U.S.C. § 103(a). The rejection of the pending claims is appealed. The pending claims are shown in the attached Appendix A.

### **Status of Amendments**

No amendments to the claims were made in response to the First Office Action, dated January 9, 2008, nor in response to the Final Office Action, dated July 10, 2008. For purposes of appeal, the claims as listed in the response to the Final Office Action were entered and an explanation of how the claims were rejected was provided.

### Summary of Claimed Subject Matter

Independent claim 1 recites a method for the preparation of a heterogenised catalyst component that comprises (a) providing a halogenated precursor component characterized by the formula,  $X[CH_2]_nCH_3$ ; (b) reacting the halogenated precursor with an ionic liquid precursor IL to prepare an ionic liquid of the formula,  $IL^+X^-$ ; (c) mixing in a solvent the ionic liquid,  $IL^+X^-$ , with a metallocene catalyst component of the formula,  $R''(Cp)(Cp')M Q_2$ ; (d) heterogenising the ionic liquid/metallocene system of (c) by addition of an apolar solvent to induce the precipitation reaction; and (e) retrieving a metallocene catalyst component heterogenised by said ionic liquid. The Cp and Cp' are independently a substituted or unsubstituted cyclopentadienyl group, M is a metal from Group 4 of the Periodic Table, R'' is a structural bridge imparting stereorigidity between Cp and Cp' and Q is a halogen or an alkyl having from 1 to 12 carbon atoms. The amounts of ionic liquid and catalyst component are in a molar ratio, (ionic liquid)/(catalyst component), of from 5:1 to 1:5. *See*, specification, at least at page 2, lines 14-25 and page 3, lines 1-14.

Dependent claim 15 recites the further limitation that the ionic liquid and the catalyst component are in approximately equal stoichiometric amounts. *See*, specification, at least at page 3, lines 16-17.

Dependent claim 29 recites the preparation of an alpha olefin polymer that comprises (a) providing a heterogenized catalyst system that comprises a heterogenized catalyst component produced by the process of Independent claim 13 and an activating agent; (b) introducing the heterogenized catalyst system in an apolar solvent and an alpha olefin monomer into a polymerization reactor; (c) operating the reactor under

polymerization conditions; and (d) recovering the alpha olefin polymer product from the reactor. *See*, specification, at least at page 8, lines 14-20.

Dependent claim 31 recites the further limitation that the apolar solvent of Dependent claim 29 is n-heptane. *See*, specification, at least at page 9, lines 1-2.

The claimed invention provides for a method of preparing metallocene catalyst systems that are very active for the polymerization of olefins by using ionic liquids to heterogenise the metallocene catalyst component. *See*, specification, at least at page 1, lines 5-7.



### **Grounds of Rejection to be Reviewed on Appeal**

1. The rejection of claims 13-32 under 35 U.S.C. § 103(a) as being unpatentable over Hlatky (WO 01/81436).

## Arguments

### I. THE EXAMINER ERRED IN REJECTING CLAIMS 13-32 UNDER 35 U.S.C. §103(A) AS BEING UNPATENTABLE OVER *Hlatky*.

*Hlatky* teaches a polymerization process that occurs in the presence of a single-site catalyst, an optional activator, and an ionic liquid. (*Hlatky*, page 3, lines 18-20). Specifically, *Hlatky* teaches that the use of ionic liquids as solvents allows for the elimination of organic solvents in the polymerization process. (*Hlatky*, page 2, lines 4-16). *Hlatky* discloses a polymerization process wherein the ionic liquid is used as a solvent and is thus used in large amounts with respect to the single-site catalyst. (See *Hlatky*, page 2, lines 17-27). Furthermore, *Hlatky* states that a catalyst support “may be undesirable for practicing the process of the invention.” (*Hlatky*, page 7, lines 17-19). *Hlatky* states that the “polymerization is performed in the presence of an ionic liquid.” (*Hlatky*, page 6, line 3). Additionally, *Hlatky* describes and teaches a polymerization process, but does not teach a process for heterogenizing or preparing a metallocene catalyst component or system.

The Examiner states that *Hlatky* states that “[w]hen slurry polymerization is conducted, *Hlatky*’s catalyst composition must be suspended in a diluent, and the most common used diluent are hydrocarbons such as isobutene, hexane and heptane.” (First Office Action, dated January 9, 2008, page 2, last paragraph, lines 4-6). This statement goes against the teaching of *Hlatky*, which has the specific objective of eliminating the use of such organic solvents. (See *Hlatky*, page 2, lines 4-16 and page 3, lines 10-15). Additionally, the Examiner states that *Hlatky* refers to ionic liquids as “good solvents”, which reinforces Appellants argument that *Hlatky* is using the ionic liquid as a solvent instead of how it is being used in the present invention. (Final Office Action, dated July 10, 2008, page 2, last paragraph, lines 5-6). Furthermore, the Examiner refers to page 7, line 17 of *Hlatky* and states that a catalyst support can be used, but the Examiner fails to refer to the immediately following sentence, wherein *Hlatky* states that a support may be undesirable for the process. (Final Office Action, dated July 10, 2008, page 3, first full paragraph, lines 1-8, and *Hlatky*, page 7, lines 17-19).

“To establish a prima facie case of obviousness . . . there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available

to one of ordinary skill in the art, to modify the reference or to combine reference teachings.” *See*, MPEP §2142.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim limitations. *See*, MPEP §706.02(j); *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The Supreme Court recently rejected a formalistic and rigid application of the teaching, suggestion, or motivation test as an exclusive test in the obviousness inquiry, it nevertheless made clear that an invention “composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). The Supreme Court further stated that “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine elements in the way the claimed new invention does.” *Id.*

Appellants respectfully argue that there is no motivation to modify the reference, nor does it provide a *prima facie* case of obviousness. First, the reference relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference. *See, Karsten Mfg. Corp. v. Cleveland Gulf Co.*, 242 F.3d 1376, 1385 (Fed. Cir. 2001). Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *See, Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1209 (Fed. Cir. 1991).

The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification. *See, In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984).

Particularly, Appellants respectfully argue that *Hlatky* discloses a polymerization process, but does not disclose a method of preparing a metallocene catalyst component or system. The process disclosed by *Hlatky* requires significant amounts of ionic liquid to

be used as a solvent and organic solvents are to be avoided. (*Hlatky*, page 2, lines 4-16, page 3, lines 10-15, and page 7, lines 10-16).

*Hlatky* does not disclose the preparation of a metallocene catalyst system or component. *Hlatky* discloses a polymerization process that would not include the use of any organic solvents. (*Hlatky*, page 2, lines 4-16, page 3, lines 10-15, and page 3, lines 18-21).

There is no motivation to modify *Hlatky* because *Hlatky* is not addressing the preparation of a catalyst component or system. This reference merely demonstrates that elements of the invention were, independently, known in the prior art, but does not combine those elements into the claimed invention.

As claimed in claim 13, the method of preparing a catalyst component is not disclosed in *Hlatky* because *Hlatky* only discloses a polymerization process. The presently described method is for the preparation of a catalyst component, which can then be used to polymerize an alpha olefin. (See, pages 4-7 and page 8, lines 14-30, to page 9, lines 1-7). As claimed in claim 15, the catalyst component is not obvious from *Hlatky* because the ionic liquid and the metallocene component are mixed in stoichiometric or nearly stoichiometric amounts, followed by the precipitation of grains of active catalyst with an apolar non-coordinating solvent, such as, for example, n-heptane. (See, page 3, lines 16-17, page 5, lines 9-30, and page 6, lines 1-2). Additionally, the catalyst component is supported, as stated in the specification at page 6, line 14. The resulting supported catalyst system is thus created in situ by the precipitation of the ionic liquid/metallocene component mixture. If the ionic liquid is used in large excess in the present system, it deactivates the catalyst. Therefore, Appellants argue that *Hlatky* does not teach, show, or suggest the precipitation of the ionic liquid/metallocene component mixture in order to create solid grains of active catalyst.

As claimed in claim 29, the method of preparing a polymer includes the use of an apolar solvent, which is an organic solvent, such as an alkane or n-heptane. (See, specification, at least at page 9, lines 1-2). Appellants argue that the present invention differs from *Hlatky* because *Hlatky*'s polymerization process requires the use of an ionic liquid as a solvent in the polymerization process and does not use organic solvents. (*Hlatky*, page 2, lines 4-16, page 3, lines 10-21.)

Appellants submit that there is no motivation (nor a reasonable expectation of success) to modify the teachings of *Hlatky* to obtain the method of preparing a catalyst component or the method of preparing a polymer using the catalyst component.

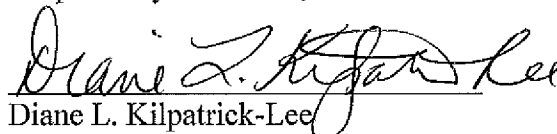
Based on such arguments, Appellants respectfully request reversal of the rejection.

### Conclusion

In conclusion, the reference of record does not teach, show or suggest the method of preparing metallocene catalyst components as recited in the pending claims. Thus, Appellants respectfully request reversal of the rejections of claims 13-32.

Date 12/04/08

Respectfully submitted,



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### Appendix A - Pending Claims

13. A method for the preparation of heterogenised catalyst component comprising:

- a) providing a halogenated precursor component characterized by the formula:



- b) reacting the halogenated precursor with an ionic liquid precursor IL to prepare an ionic liquid of the formula;



- c) mixing in a solvent the ionic liquid  $\text{IL}^+\text{X}^-$  with a metallocene catalyst component of the formula:



wherein:

Cp and Cp' are independently a substituted or unsubstituted cyclopentadienyl group, M is a metal from Group 4 of the Periodic Table, R'' is a structural bridge imparting stereorigidity between Cp and Cp' and Q is a halogen or an alkyl having from 1 to 12 carbon atoms

wherein the amounts of ionic liquid and catalyst component are in a molar ratio (ionic liquid)/(catalyst component) of from 5:1 to 1:5;

- d) heterogenising the ionic liquid/metallocene system of subparagraph c) by addition of an apolar solvent to induce the precipitation reaction; and  
e) retrieving a metallocene catalyst component heterogenised by said ionic liquid.

14. The method of claim 13 wherein the ionic liquid precursor is an N-hydrocarbyl imidazole or pyridine.

15. The method of claim 14 wherein the ionic liquid and the catalyst component are in approximately equal stoichiometric amounts.

16. The method of claim 14 wherein said ionic liquid precursor is an N-R imidazole in which R is an aryl group or an alkyl group having from 1-12 carbon atoms.
17. The method of claim 14 wherein the ionic liquid precursor is 1-methyl-3-pentylimidazolium bromide or N-pentyl pyridinium bromide.
18. The method of claim 13 further comprising prior to subparagraph c) reacting said ionic liquid with an ionic compound characterized by the formula  $C^+A^-$  wherein  $C^+$  is a cation selected from the group consisting of  $K^+$ ,  $Na^+$ ,  $NH_4^+$ , and  $A^-$  is an anion selected from the group consisting of  $PF_6^-$ ,  $SbF_6^-$ ,  $BF_4^-$ ,  $(CF_3-SO_2)N^-$ ,  $ClO_4^-$ ,  $CF_3-SO_3)_2N^-$ ,  $ClO_4^-$ ,  $CF_3SO_3^-$ ,  $NO_3^-$  or  $CF_3CO_2^-$ .
19. The method of claim 13 wherein the solvent of subparagraph c) is selected from a group consisting of tetrahydrofuron, methylene dichloride, and toluene.
20. The method of claim 19 wherein said apolar solvent is a liquid alkane.
21. The method of claim 20 wherein said apolar solvent is n-heptane.
22. The method of claim 19 further comprising subsequent to subparagraph c) and prior to subparagraph d) evaporating at least a portion of said solvent prior to the addition of said apolar solvent.
23. The method of claim 13 wherein the ligand structure of said metallocene catalyst component incorporates a substituted or unsubstituted bis-indenyl ligand structure, a substituted or unsubstituted bis-benzindenyl ligand structure, or a substituted or unsubstituted bis-tetrahydroindenyl ligand structure.
24. The method of claim 23 wherein said metallocene catalyst component is an ethylene bis-tetrahydroindenyl zirconium dichloride, dimethyl silyl bis (2-

methylbenzindenyl zirconium dichloride, or dimethyl silyl (2-methyl-4-phenyl-indenyl zirconium dichloride).

25. A heterogenized metallocene catalyst component produced by the method of claim 13.

26. A heterogenized catalyst system comprising the catalyst component of claim 25 and an activating agent.

27. The catalyst system of claim 26 wherein the activating agent is methylaluminoxane and Q is a halogen.

28. The catalyst system of claim 27 wherein the methylaluminoxane is present in an amount to provide an Al/M ratio within the range of 100 to 1,000.

29. A method for the preparation of an alpha olefin polymer comprising:

- a) providing a heterogenized catalyst system comprising a heterogenized catalyst component produced by the process of claim 13 and an activating agent for said catalyst component;
- b) introducing said heterogenised catalyst system in an apolar solvent and an alpha olefin monomer into a polymerisation reactor;
- c) operating said reactor under polymerisation conditions; and
- d) recovering an alpha olefin polymer product from said reactor.

30. The method of claim 29 wherein said alpha olefin monomer comprises ethylene or propylene.

31. The method of claim 30 wherein said apolar solvent is n-heptane.



32. The method of claim 25 wherein said activating agent is methylalumoxane and wherein said ionic liquid precursor is 1-methyl-3-pentylimidazolium bromide or N-pentyl pyridinium bromide.

## Appendix B - Evidence

1. *Hlatky*, PCT Publication No. WO 01/81436.
2. MPEP §2142.
3. MPEP §706.02(j).
4. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).
5. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007).
6. *Karsten Mfg. Corp. v. Cleveland Gulf Co.*, 242 F.3d 1376 (Fed. Cir. 2001).
7. *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200 (Fed. Cir. 1991).
8. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984).

### **Appendix C - *Related Proceedings***

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